AMENDMENT TO THE CLAIMS

1. (Original) Apparatus for controlling switching circuitry for generating an analog output from a digital signal, the digital signal carrying multi-bit values at a sampling rate, the digital signal including first and second digital sub-signals carrying respective least and most significant components of the multi-bit values carried by the digital signal, comprising:

pulse width modulation (PWM) circuitry operative to generate a pulse width modulated signal based on the first digital sub-signal; and

switch control circuitry under the control of the pulse width modulated signal and the second digital sub-signal and operative via the switching circuitry to produce the analog output.

2. (Original) Apparatus according to claim 1, further comprising a noise shaper operative to generate a coarsely quantized digital sub-signal from the first digital sub-signal, and wherein the PWM circuitry is operative in response to the coarsely quantized digital sub-signal.

3. (Original) Apparatus according to claim 1, wherein the digital signal is a first digital signal and the sampling rate is a first relatively high sampling rate, and further comprising an interpolator operative to perform interpolation based on a second digital signal to obtain the first digital signal, the second digital signal carrying multi-bit values at a second sampling rate lower than the first sampling rate.

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4. (Currently Amended) Apparatus according to claim 1, wherein:

the analog output is generated from a multi-level electrical signal which includes a pulse width modulated component and a multi-level component;

the switching circuitry includes a plurality of switches each operative in response to assertion of a corresponding one of switch control signals to provide one of a set of distinct levels of the multi-level electrical signal;

the PWM circuitry includes a pulse width modulation (PWM) converter operative to generate the pulse width modulated signal ~~and a maximum-width-pulse signal, the maximum-width-pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the multi-level electrical signal~~ based on the first digital sub-signal; and

the switch control circuitry includes a level selector operative to assert each of the switch control signals based on the pulse width modulated signal, ~~the~~ a maximum-width-pulse signal and the second digital sub-signal, the maximum-width-pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the pulse width modulated signal.

5. (Original) Apparatus according to claim 4, wherein:

the assertion of a first one of the switch control signals by the level selector in response to a corresponding value of the second digital sub-signal establishes a base level of the multi-level electrical signal for a sampling cycle; and

during a given cycle, the level selector is further operative in response to the pulse width modulated signal to assert a second one of the switch control signals to provide a pulse level of the

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multi-level electrical signal, the pulse level of the multi-level electrical signal being different from the base level of the multi-level electrical signal.

6. (Currently Amended) Apparatus according to claim 5, wherein the second switch control signal is asserted during a first period of the cycle as established by the pulse width modulated signal, the first switch control signal is asserted during a second period which is outside the first period of the cycle and within the maximum pulse duration in the cycle as established by the maximum-width-pulse signal, and neither the first switch control signal nor the second switch control signal but a third switch control signal is asserted during a third period of the cycle constituting a remainder portion beyond the maximum permissible pulse duration to provide an idle level of the multi-level electrical signal.

7. (Original) Apparatus according to claim 5, wherein the lowest value of the second digital sub-signal corresponds to the lowest base level of the multi-level electrical signal which is also the lowest level of the multi-level electrical signal, and successively higher values of the second digital sub-signal correspond to successively higher base levels of the multi-level electrical signal.

8. (Currently Amended) Apparatus according to claim 4, wherein each of the levels in the set of distinct levels of the multi-level electrical signal is a corresponding ~~multiple~~ ratio of a reference level.

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9. (Currently Amended) Apparatus according to claim 4, wherein the plurality of switches are arranged in a multiple H-bridge configuration and are operative to apply either (1) zero voltage level to both ends of a load connected to the switches, or (2) ~~equal magnitudes of~~ a positive ~~and~~ or negative voltage level to ~~opposite~~ one ~~end~~s of the load and a zero voltage level to the other end at ~~one~~ any given time, such that current flowing through the load in one direction represents one positive voltage level, current flowing through the load in the reverse direction represents one negative voltage level, and no current flowing through the load represents a zero voltage level.

10. (Currently Amended) Apparatus according to claim 4, wherein the analog output is ~~an acoustic analog~~ a physical output.

11. (Currently Amended) Apparatus according to claim 10, wherein the ~~acoustic analog~~ physical output is an ~~audio~~ acoustic output.

12. (Original) Apparatus according to claim 4, wherein control of the magnitude of the analog output is obtained by controlling the magnitude of each of the levels in the set of distinct levels of the multi-level electrical signal.

13. (Currently Amended) Apparatus according to claim 4, wherein:

the multi-level electrical signal is one of a plurality of multi-level electrical signals from which the analog output is generated, each multi-level electrical signal being generated from a corresponding one of a plurality of channels;

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the plurality of switches is one set of a plurality of sets of switches, each set being associated with a corresponding one of the channels, and the switch control signals are one set of a plurality of first sets of control signals, each first set of control signals being associated with a corresponding channel, each switch in the set of switches for each channel being operative in response to assertion of a corresponding one of the first set of control signals for the channel to provide one of the set of distinct levels of the multi-level electrical signal of the channel; ~~and~~

the level selector is one of a plurality of level selectors each being associated with a corresponding one of the channels, the level selector of each channel being operative to assert each of the first set of control signals of the channel in response to a corresponding one of a plurality of second sets of control signals;

and the switch control circuitry further ~~comprising~~ includes an encoder operative to generate the second sets of control signals based on the second digital sub-signal.

14. (Currently Amended) Apparatus for controlling switching circuitry for generating an analog output from a digital signal, the digital signal carrying multi-bit values at a sampling rate, the digital signal including first and second digital sub-signals carrying respective least and most significant components of the multi-bit values carried by the digital signal, the analog output being generated by additively combining a plurality of analog component outputs from a corresponding plurality of channels, each analog component output being generated from a corresponding one

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of a plurality of electrical signals, the switching circuitry including a plurality of switches, each switch being associated with a corresponding one of the channels, the switch for the first channel being operative in response to assertion of a pulse width modulated signal to generate a corresponding one of the electrical signals, the switch for each of the other channels being operative based on assertion of a corresponding one of switch control signals to generate a predetermined level on the electrical signal of the corresponding channel, the apparatus comprising:

pulse width modulation (PWM) circuitry operative ~~via the switching circuitry to produce a corresponding one of a plurality of analog component outputs~~ to generate the pulse width modulated signal based on the first digital sub-signal; and

switch control circuitry operative to assert different numbers of the switch control signals based on the second digital sub-signal.

15. (Original) Apparatus according to claim 14, further comprising a noise shaper operative to generate a coarsely quantized digital sub-signal from the first digital sub-signal, and wherein the PWM circuitry is operative in response to the coarsely quantized digital sub-signal.

16. (Currently Amended) Apparatus according to claim 14, ~~wherein the digital signal is a first digital signal and the sampling rate is a first relatively high sampling rate, and further comprising an interpolator operative to perform interpolation based on a second digital signal to obtain the first digital signal, the second digital signal carrying multi bit values at a second~~

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~~sampling rate lower than the first sampling rate~~further comprising an interpolator operative to generate a first digital signal from the digital signal, the first digital signal carrying multi-bit values at a first sampling rate higher than the sampling rate of the digital signal and wherein the first and second digital sub-signals are not included in the digital signal but included in the first digital signal and carry respective least and most significant components of the multi-bit values carried by the first digital signal..

17. (Original) Apparatus according to claim 14, wherein ~~the predetermined level generated on~~ each of the electrical signals is generated with the same predetermined level.

18. (Currently Amended) Apparatus according to claim 14, wherein the switch control circuitry includes an encoder operative to assert zero number of switch control signals when the value of the second digital sub-signal is zero, and successively greater numbers of the switch control signals for successively higher values of the second digital sub-signal.

19. (Currently Amended) Apparatus according to claim 14, wherein:

the plurality of electrical signals include fixed-pulse-width electrical signals and a variable-pulse-width electrical signal, and the analog component outputs include fixed-pulse-width analog component outputs and a variable-pulse-width analog component output generated from the fixed-pulse-width electrical signals and a variable-pulse-width electrical signal respectively;

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the analog output is further generated by additively combining the fixed-pulse-width analog component outputs with the variable-pulse-width analog component output;

the switching circuitry includes the ~~a~~ switch for the first channel operative in response to assertion of ~~a~~ the pulse width modulated signal to generate ~~a predetermined level on~~ the variable-pulse-width electrical signal, and the other switches each operative in response to assertion of a corresponding one of switch control signals and a maximum-width-pulse signal to generate a predetermined level on the corresponding fixed-pulse-width electrical signal, the maximum-width-pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the pulse width modulated signal; and

the PWM circuitry includes a pulse width modulation (PWM) converter operative to generate the pulse width modulated signal ~~and a maximum width pulse signal, the pulse width modulated signal being~~ based on the first digital sub-signal~~, the maximum width pulse signal establishing the pulse duration in a sampling cycle for the fixed pulse width electrical signals~~.

20. (Currently Amended) Apparatus according to claim 14, wherein ~~each of~~ the plurality of switches ~~is~~ are not coupled to a ~~different~~ single power supply.

21. (Currently Amended) Apparatus according to claim 14, wherein:

each of the electrical signals is a multi-level electrical signal generated from a corresponding channel;

each of the switches is a first switch of a corresponding set of switches in a corresponding one of the channels, and each of

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the switch control signals is one of a first set of control signals of the corresponding channel, each switch within each set of switches for each channel being operative in response to assertion of a corresponding one of the first set of control signals of the channel to generate one of a set of distinct levels of the multi-level electrical signal of the channel; and

the switch control circuitry further includes a plurality of level selectors each associated with a corresponding channel, each level selector being operative to assert each of the first set of control signals of the channel in response to a corresponding one of a plurality of second sets of control signals~~,~~ and further ~~comprising~~ includes an encoder operative to generate the second sets of control signals based on the second digital sub-signal.

22. (Currently Amended) Apparatus according to claim 14, wherein the digital signal is a first frequency component and each of the analog component outputs is in a first frequency band associated with the first frequency component, the analog component outputs in the first frequency band being additively combined to form a first frequency analog output, and the analog output is generated by additively combining the first frequency analog output in the first frequency band with a second frequency analog output in a second frequency band associated with a second frequency component, and wherein the channels are channels in the first frequency band and the switching circuitry, PWM circuitry, pulse width modulated signal, maximum-width-pulse signal, switch control signals and switch control circuitry are first switching circuitry, first PWM circuitry, first pulse width modulated signal, first maximum-width-pulse signal, first switch control

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signals and first switch control circuitry respectively associated with the first frequency band, and further comprising:

a band-separating filter operative to generate the first and second frequency components of the digital signal;

second switching circuitry including a switch operative in response to assertion of a second pulse width modulated signal to generate ~~a predetermined level on~~ an electrical signal from which the second frequency analog output is generated; and

second PWM circuitry operative to generate the second pulse width modulated signal based on the second frequency component.

23. (Currently Amended) Apparatus according to claim 22, wherein:

the second frequency component includes third and fourth digital sub-signals carrying respective least and most significant components of the multi-bit values carried by the second frequency component;

the electrical signal is one of a plurality of electrical signals in the second frequency band, each electrical signal being generated from a corresponding one of a plurality of channels in the second frequency band, the second frequency analog output being generated by additively combining a plurality of analog component outputs from the plurality of channels in the second frequency band, each analog component output in the second frequency band being generated from a corresponding one of a plurality of electrical signals of the channels in the second frequency band;

the switch in the second switching circuitry is one of a plurality of switches, each switch being associated with a corresponding one of the channels in the second frequency band,

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the switch for ~~one of~~ the first channel in the second frequency band being operative in response to assertion of ~~a~~ the second pulse width modulated signal to generate ~~a predetermined level on~~ a corresponding one of the electrical signals, the switch for each of the other channels in the second frequency band being operative in response to assertion of a corresponding one of second switch control signals and a second maximum-width-pulse signal to generate a predetermined level on the electrical signal of the corresponding channel in the second frequency band, the second maximum-width-pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the ~~electrical signals of those other channels in the second frequency band~~ second pulse width modulated signal; and

the second PWM circuitry operative to generate the second pulse width modulated ~~electrical~~ signal ~~and the maximum width-pulse signal, the pulse width modulated signal being~~ based on the third digital sub-signal; and further comprising

second switch control circuitry including an encoder operative to assert different numbers of the second switch control signals based on the fourth digital sub-signal.

24. (Original) Apparatus according to claim 22, wherein the first frequency band is a higher frequency band with more channels and the second frequency band is a lower frequency band with fewer channels.

25. (Currently Amended) Apparatus according to claim 14, wherein the analog output is ~~an acoustic analog~~ a physical output.

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26. (Currently Amended) Apparatus according to claim 25, wherein the ~~acoustic analog~~ physical output is an ~~audio~~ acoustic output.

27. (Original) Apparatus according to claim 14, the apparatus being contained within a single enclosure.

28. (Original) Apparatus according to claim 14, wherein control of the magnitude of the analog output is obtained by controlling the magnitude of the predetermined levels used by the switching circuitry of the channels.

29. (Currently Amended) Apparatus for controlling switching circuitry for generating an analog output from a digital signal, the digital signal carrying multi-bit values at a sampling rate, the digital signal including first and second digital sub-signals carrying respective least and most significant components of the multi-bit values carried by the digital signal, the analog output being generated by additively combining analog component outputs from first and second channels, the analog component output of the second channel being generated from a multi-level electrical signal, the switching circuitry including a set of switches each operative based on assertion of a corresponding one of first set of control signals for the second channel to provide one of a set of distinct levels of the multi-level electrical signal of the second channel, the apparatus comprising:

pulse width modulation (PWM) circuitry operative to generate a pulse width modulated signal ~~and a maximum width pulse signal~~, the pulse width modulated signal being based on the first digital sub-signal~~, the maximum width pulse signal establishing the~~

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~~maximum permissible pulse duration in a sampling cycle for the electrical signals of the first and second channel, the pulse width modulated signal being~~ and operative via the switching circuitry to generate an electrical signal from which the analog component output of the first channel is generated; and

~~a level selector associated with the second channel, the level selector being operative to assert each of the first set of control signals of the second channel in response to a second set of control signals for the second channel; and~~

~~an encoder operative to generate the second set of control signals for the second channel based on the second digital sub-signal~~switch control circuitry including a level selector associated with the second channel operative to assert each of the first set of control signals of the second channel based on the second digital sub-signal and a maximum-width-pulse signal, the maximum-width-pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the pulse width modulated signal.

30. (Currently Amended) Apparatus according to claim 29, wherein the second channel is one of a plurality of fixed-pulse-width channels;

the multi-level electrical signal is one of a plurality of multi-level electrical signals, each multi-level electrical signal being generated from a corresponding one of a plurality of fixed-pulse-width channels;

the analog output is generated by additively combining a plurality of analog component outputs from the first channel and the plurality of fixed-pulse-width channels, ~~each~~ the analog

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component output of ~~the~~ each fixed-pulse-width channel~~s~~ being generated from a corresponding one of the multi-level electrical signals;

the set of switches is one set of a plurality of sets of switches, each set being associated with a corresponding one of the fixed-pulse-width channels, the first set of control signals for the second channel are one set of a plurality of first sets of control signals for the plurality of fixed-pulse-width channels, ~~and the second set of control signals are one set of a plurality of second sets of control signals for the fixed-pulse-width channels,~~ each first set of control signals for the fixed-pulse-width channels being associated with a corresponding fixed-pulse-width channel, each switch in the set of switches for each fixed-pulse-width channel being operative in response to assertion of a corresponding one of the first set of control signals for the corresponding fixed-pulse-width channel to provide one of the set of distinct levels of the multi-level electrical signal of the corresponding fixed-pulse-width channel;

the level selector associated with the second channel is one of a plurality of level selectors each being associated with a corresponding one of the fixed-pulse-width channels, the level selector of each fixed-pulse-width channel being operative to assert each of the corresponding first set of control signals of the fixed-pulse-width channel in response to a corresponding one of a plurality of second sets of control signals and the maximum-width-pulse signal; and

the switch control circuitry further includes an ~~the~~ encoder ~~is~~ operative to generate the second sets of control signals based on the second digital sub-signal.

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31. (Currently Amended) Apparatus according to claim 29, wherein (i) the electrical signal from which the analog component output of the first channel is generated is a multi-level electrical signal, and (ii) the ~~set of switches, the first and second set of control signals, and the level selector are associated with the second channel,~~ level selector associated with the second channel is operative to assert each of the first set of control signals of the second channel in response to a second set of control signals for the second channel, and (iii) the switch control circuitry includes an encoder ~~is~~ operative to generate the second sets of control signals for the first and second channels in response to the second digital sub-signal, and further comprising:

a set of switches for the first channel within the switching circuitry, each switch in the set of switches for the first channel being operative based on assertion of a corresponding one of first set of control signals for the first channel to provide one of the set of distinct levels of the multi-level electrical signal of the first channel; and

a level selector for the first channel ~~being~~ within the switch control circuitry operative to assert each of the first set of control signals of the first channel based on the pulse width modulated signal, the maximum-width-pulse signal and the second set of control signals of the first channel.

32. (Original) Apparatus according to claim 29, wherein:

the multi-level electrical signal of the second channel is a fixed-pulse-width electrical signal, the analog component output of the second channel is a fixed-pulse-width analog component

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output, and the analog component output of the first channel is a variable-pulse-width analog component output generated from a variable-pulse-width electrical signal; and

the switching circuitry includes a set of switches for the first channel operative in response to assertion of the pulse width modulated signal to generate the variable-pulse-width electrical signal.

33. (Original) Apparatus according to claim 29, further comprising a noise shaper operative to generate a coarsely quantized digital sub-signal from the first digital sub-signal, and wherein the PWM circuitry is operative in response to the coarsely quantized digital sub-signal.

34. (Currently Amended) Apparatus according to claim 29, ~~wherein the digital signal is a first digital signal and the sampling rate is a first relatively high sampling rate, and further comprising an interpolator operative to perform interpolation based on a second digital signal to obtain the first digital signal, the second digital signal carrying multi-bit values at a second sampling rate lower than the first sampling rate~~ further comprising an interpolator operative to generate a first digital signal from the digital signal, the first digital signal carrying multi-bit values at a first sampling rate higher than the sampling rate of the digital signal and wherein the first and second digital sub-signals are not included in the digital signal but included in the first digital signal and carry respective least and most significant components of the multi-bit values carried by the first digital signal.

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35. (Currently Amended) Apparatus according to claim 29, wherein the digital signal is a first frequency component and each of the analog component outputs is in a first frequency band associated with the first frequency component, the analog component outputs in the first frequency band being additively combined to form a first frequency analog output, and the analog output is generated by additively combining the first frequency analog output in the first frequency band with a second frequency analog output in a second frequency band associated with a second frequency component, ~~the second frequency component including third and fourth digital sub-signals carrying respective least and most significant components of the second frequency component,~~ and wherein the channels are channels in the first frequency band and the switching circuitry, pulse width modulated signal, maximum-width-pulse signal, PWM circuitry, level selector ~~and encoder~~ and switch control circuitry are first switching circuitry, first pulse width modulated signal, first maximum-width-pulse signal, first PWM circuitry, first level selector and first ~~encoder~~ switch control circuitry respectively associated with the first frequency band, and further comprising:

a band-separating filter operative to generate the first and second frequency components of the digital signal;

second switching circuitry operative in response to assertion of a second pulse width modulated signal ~~third set of control signals~~ to generate an electrical signal from which the second frequency analog output ~~in the second frequency band~~ is generated; and

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second pulse width modulation (PWM) circuitry operative to generate ~~a~~ the second pulse width modulated signal ~~and a maximum-width pulse signal, the pulse width modulated signal~~ based on the second frequency component~~third digital sub signal, the maximum-width pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the electrical signal; and~~

~~second level selector being operative to assert each of the third set of control signals based on the pulse width modulated signal, the maximum width pulse signal and the fourth digital sub-signal~~.

36. (Currently Amended) Apparatus according to claim ~~35~~ 72, wherein the multi-level electrical signal is ~~a multi-level electrical signal~~ one of a plurality of multi-level electrical signals ~~from which the second frequency analog output~~ in the second frequency band ~~is generated~~, each multi-level electrical signal in the second frequency band being generated from a corresponding one of a plurality of channels in the second frequency band;

the second frequency analog output is generated by additively combining a plurality of analog component outputs from the plurality of channels in the second frequency band, the analog component output of each channel in the second frequency band being generated from a corresponding one of the multi-level electrical signals;

the second switching circuitry includ~~ing~~es a plurality of sets of switches, each set being associated with a corresponding one of the channels in the second frequency band, and the third set of control signals is one set of a plurality of third sets of

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control signals, each third set of control signals being associated with a corresponding channel in the second frequency band, each switch in the set of switches for each channel in the second frequency band being operative in response to assertion of a corresponding one of the third set of control signals for the corresponding channel in the second frequency band to provide one of a set of distinct levels of the multi-level electrical signal of the corresponding channel in the second frequency band;

the second level selector is one of a plurality of second level selectors each being associated with a corresponding one of the channels in the second frequency band, the second level selector associated with a first one of the channels in the second frequency band being operative to assert each of the third set of control signals of the first channel in the second frequency band based on the second pulse width modulated signal, the second maximum-width-pulse signal and a fourth set of control signals for the first channel in the second frequency band, each of the other second level selectors being operative to assert control signals of the third set of control signals of the corresponding channel in the second frequency band in response to a fourth set of control signals for the corresponding channel in the second frequency band and the second maximum-width-pulse signal; and

the second switch control circuitry further ~~comprising a second~~ includes an encoder ~~in the second frequency band~~ operative to generate the fourth set of control signals for each channel in the second frequency band based on the fourth digital sub-signal.

37. (Original) Apparatus according to claim 35, wherein the first frequency band is a higher frequency band with more channels and

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the second frequency band is a lower frequency band with fewer channels.

38. (Currently Amended) Apparatus according to claim 29, wherein the analog output is ~~an acoustic analog~~ a physical output.

39. (Currently Amended) Apparatus according to claim 38, wherein the ~~acoustic analog~~ physical output is an ~~audio~~ acoustic output.

40. (Original) Apparatus according to claim 29, the apparatus being contained within a single enclosure.

41. (Currently Amended) Apparatus according to claim 29, wherein each of the levels in the set of distinct levels of each electrical signal is a corresponding ~~multiple~~ ratio of a reference level.

42. (Currently Amended) Apparatus according to claim ~~29~~41, wherein control of the magnitude of the analog output is obtained by controlling the magnitude of ~~each of the set of distinct levels of the multi level electrical signal~~the reference level.

43. (Currently Amended) Apparatus according to claim 29, wherein the switches in each set of switches are arranged in a multiple H-bridge configuration and are operative to apply either (1) zero voltage level to both ends of a load connected to the switches, or (2) ~~equal magnitudes of~~ a positive ~~and~~ or negative voltage level to ~~opposite~~ one ~~end~~s of the load and a zero voltage level to the other end at ~~one~~ any given time, such that current flowing through

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the load in one direction represents one positive voltage level, current flowing through the load in the reverse direction represents one negative voltage level, and no current flowing through the load represents a zero voltage level.

44. (Currently Amended) Apparatus according to claim 29, wherein ~~each set of~~ the plurality of sets of switches ~~is~~ are not coupled to a ~~different~~ single power supply.

45. (Currently Amended) A digital audio system for generating an acoustic audio signal from a digital signal, the digital signal carrying multi-bit audio values at a sampling rate, the digital signal including first and second digital sub-signals carrying respective least and most significant components of the multi-bit audio values carried by the digital signal, the acoustic audio signal being generated from a multi-level electrical signal, the system comprising:

a loudspeaker;

a low-pass filter coupled to the loudspeaker;

switching circuitry coupled to the low-pass filter, the switching circuitry including a plurality of switches each operative in response to assertion of a corresponding one of switch control signals to provide one of a set of distinct levels of a multi-level electrical signal, the multi-level electrical signal being provided to the low-pass filter;

pulse width modulation (PWM) circuitry operative to generate a pulse width modulated signal ~~and a maximum-width pulse signal, the pulse width modulated signal being~~ based on the first digital sub-signal~~, the maximum-width pulse signal establishing the~~

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~~maximum permissible pulse duration in a sampling cycle for the multi-level electrical signal~~; and

switch control circuitry including a level selector operative to assert each of the switch control signals based on the pulse width modulated signal, ~~the~~ a maximum-width-pulse signal and the second digital sub-signal, the maximum-width-pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the pulse width modulated signal.

46. (Currently Amended) A digital audio system according to claim 45, wherein the plurality of switches are arranged in a multiple H-bridge configuration and are operative to apply either (1) zero voltage level to both ends of a load connected to the switches, the load comprising of a low-pass filter coupled to a loudspeaker, or (2) ~~equal magnitudes of~~ a positive ~~and~~ or negative voltage level to ~~opposite~~ one ~~end~~s of the load and a zero voltage level to the other end at ~~one~~ any given time, such that current flowing through the load in one direction represents one positive voltage level, current flowing through the load in the reverse direction represents one negative voltage level, and no current flowing through the load represents a zero voltage level.

47. (Original) A digital audio system according to claim 45, wherein the switching circuitry is operative to select positive and negative voltages to generate the acoustic audio signal.

48. (Currently Amended) A digital audio system according to claim 45, wherein each of the levels in the set of distinct levels of the multi-level electrical signal is a corresponding ~~multiple~~

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ratio of a reference level and control of the volume of the acoustic audio signal is obtained by controlling the magnitude of the reference level.

49. (Currently Amended) A digital audio system for generating an acoustic audio signal from a digital signal, the digital signal carrying multi-bit audio values at a sampling rate, the digital signal including first and second digital sub-signals carrying respective least and most significant components of the multi-bit audio values carried by the digital signal, the acoustic audio signal being generated by additively combining a plurality of acoustic audio component signals from a corresponding plurality of channels, each acoustic audio component signal being generated from a corresponding one of a plurality of pulse electrical signals which include fixed-width pulse electrical signals and a variable-width pulse electrical signal, the system comprising:

a plurality of loudspeakers each associated with a corresponding one of the channels;

a plurality of low-pass filters each coupled to a corresponding one of the loudspeakers;

switching circuitry coupled to the low-pass filters, the switching circuitry including a plurality of switches, each switch being associated with a corresponding one of the channels, the switch for one of the channels being operative on assertion of a pulse width modulated signal to generate the variable-width pulse electrical signal, the switch for each of the other channels being operative on assertion of a corresponding one of switch control signals and a maximum-width-pulse signal to generate the corresponding fixed-width pulse electrical signal, the maximum-

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width-pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the ~~fixed-width pulse electrical signals~~ pulse width modulated signal, each pulse electrical signal being provided to the corresponding low-pass filter;

pulse width modulation (PWM) circuitry operative to generate the pulse width modulated signal ~~and the maximum-width-pulse signal, the pulse-width-modulated signal being~~ based on the first digital sub-signal; and

switch control circuitry including an encoder operative to assert different numbers of the switch control signals based on the second digital sub-signal.

50. (Currently Amended) A digital audio system according to claim 49, wherein the digital signal is a first frequency component and each of the acoustic audio component signals is in a first frequency band associated with the first frequency component, the acoustic audio component signals in the first frequency band being additively combined to form a first frequency acoustic audio signal, and the acoustic audio signal is generated by additively combining the first frequency acoustic audio signal in the first frequency band with a second frequency acoustic audio signal in a second frequency band associated with a second frequency component, and wherein the channels are channels in the first frequency band and the plurality of loudspeakers, plurality of low-pass filters, switching circuitry, switch control circuitry, pulse width modulated signal, maximum-width-pulse signal and PWM circuitry are ~~first channels,~~ a plurality of first loudspeakers, a plurality of first low-pass filters, first switching circuitry, first switch control circuitry, first pulse width modulated

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signal, first maximum-width-pulse signal and first PWM circuitry respectively associated with the first frequency band, and further comprising:

a second loudspeaker associated with the second frequency band;

a second low-pass filter coupled to the second loudspeaker;

a band-separating filter operative to generate the first and second frequency components of the digital signal;

second switching circuitry coupled to the second low-pass filter, the second switching circuitry including a switch being operative in response to assertion of a second pulse width modulated signal to generate a pulse electrical signal from which the second frequency acoustic audio signal ~~in the second frequency band~~ is generated; and

second pulse width modulation (PWM) circuitry operative to generate the second pulse width modulated signal based on the second frequency component.

51. (Currently Amended) A digital audio system according to claim 50, wherein:

the second frequency component includes third and fourth digital sub-signals carrying respective least and most significant components of the multi-bit values carried by the second frequency component;

the second loudspeaker is one of a plurality of second loudspeakers each associated with a corresponding one of the channels in the second frequency band;

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the second low-pass filter is one of a plurality of second low-pass filters each coupled to a corresponding one of the second loudspeakers;

the pulse electrical signal is one of a plurality of pulse electrical signals in the second frequency band, each pulse electrical signal being generated from a corresponding one of a plurality of channels in the second frequency band, the second frequency acoustic audio signal being generated by additively combining a plurality of acoustic audio component signals from the plurality of channels in the second frequency band, each acoustic audio component signal in the second frequency band being generated from a corresponding one of a plurality of pulse electrical signals which include fixed-width pulse electrical signals and a variable-width pulse electrical signal in the second frequency band;

each pulse electrical signal generated from a corresponding one of the channels in the second frequency band is provided to its corresponding second low-pass filter;

the switch in the second switching circuitry is one of a plurality of switches, each switch being associated with a corresponding one of the channels in the second frequency band, the switch for one of the channel in the second frequency band being operative in response to assertion of ~~a~~ the second pulse width modulated signal to generate the variable-width pulse electrical signal in the second frequency band, the switch for each of the other channels in the second frequency band being operative in response to assertion of a corresponding one of second switch control signals and a second maximum-width-pulse signal to generate the fixed-width pulse electrical signal ~~for~~ of

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the corresponding channel in the second frequency band, the second maximum-width-pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the ~~fixed-width pulse electrical signals in the second frequency band~~ second pulse width modulated signal; and

the second PWM circuitry operative to generate the second pulse width modulated ~~electrical~~ signal ~~and the maximum-width-pulse signal, the pulse width modulated signal being~~ based on the third digital sub-signal; and further comprising

second switch control circuitry including an encoder operative to assert different numbers of the second switch control signals based on the fourth digital sub-signal.

52. (Original) A digital audio system according to claim 50, wherein the first frequency band is a higher frequency band with more channels and the second frequency band is a lower frequency band with fewer channels.

53. (Currently Amended) A digital audio system according to claim 49, wherein ~~each of~~ the plurality of switches ~~is~~ are not coupled to a ~~different~~ single power supply.

54. (Currently Amended) A digital audio system according to claim 49, the ~~apparatus~~ digital audio system being contained within a single enclosure.

55. (Original) A digital audio system according to claim 49, wherein control of the volume of the acoustic audio signal is obtained by controlling the magnitude of a reference level used by

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the switching circuitry to establish the levels of the pulse electrical signals.

56. (Currently Amended) A digital audio system for generating an acoustic audio signal from a digital signal, the digital signal carrying multi-bit audio values at a sampling rate, the digital signal including first and second digital sub-signals carrying respective least and most significant components of the multi-bit audio values carried by the digital signal, the acoustic audio signal being generated by additively combining acoustic audio component signals from first and second channels, the acoustic audio component signal of the second channel being generated from a multi-level electrical signal, the system comprising:

a plurality of loudspeakers each associated with a corresponding one of the channels;

a plurality of low-pass filters each coupled to a corresponding one of the loudspeakers;

switching circuitry including a set of switches each operative based on assertion of a corresponding one of first set of control signals for the second channel to provide one of a set of distinct levels of the multi-level electrical signal of the second channel;

pulse width modulation (PWM) circuitry operative to generate a pulse width modulated signal ~~and a maximum width pulse signal~~, the pulse width modulated signal being based on the first digital sub-signal~~, the maximum width pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the electrical signals of the first and second channel, the pulse width modulated signal being~~ and operative via the switching

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circuitry to generate an electrical signal from which the acoustic audio component signal of the first channel is generated;

each electrical signal being provided to its corresponding low-pass filter; and

switch control circuitry including a level selector associated with the second channel operative to assert each of the first set of control signals of the second channel based on the second digital sub-signal and a maximum-width-pulse signal, the maximum-width-pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the pulse width modulated signal.

~~a level selector associated with the second channel, the level selector being operative to assert each of the first set of control signals in response to a second set of control signals; and~~

~~an encoder operative to generate the second set of control signals based on the second digital sub signal.~~

57. (Currently Amended) A digital audio system according to claim 56, wherein the second channel is one of a plurality of fixed-pulse-width channels;

the multi-level electrical signal is one of a plurality of multi-level electrical signals, each multi-level electrical signal being generated from a corresponding one of a plurality of fixed-pulse-width channels;

the acoustic audio signal is generated by additively combining a plurality of acoustic audio component signals from the first channel and the plurality of fixed-pulse-width channels, ~~each~~ the acoustic audio component signal of ~~the~~ each fixed-pulse-

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width channels being generated from a corresponding one of the multi-level electrical signals;

the set of switches is one set of a plurality of sets of switches, each set being associated with a corresponding one of the fixed-pulse-width channels, the first set of control signals for the second channel are one set of a plurality of first sets of control signals for the plurality of fixed-pulse-width channels, ~~and the second set of control signals are one set of a plurality of second sets of control signals for the fixed-pulse-width channels,~~ each first set of control signals for the fixed-pulse-width channels being associated with a corresponding fixed-pulse-width channel, each switch in the set of switches for each fixed-pulse-width channel being operative in response to assertion of a corresponding one of the first set of control signals for the corresponding fixed-pulse-width channel to provide one of the set of distinct levels of the multi-level electrical signal of the corresponding fixed-pulse-width channel;

the level selector associated with the second channel is one of a plurality of level selectors each being associated with a corresponding one of the fixed-pulse-width channels, the level selector of each fixed-pulse-width channel being operative to assert each of the corresponding first set of control signals of the fixed-pulse-width channel in response to a corresponding one of a plurality of second sets of control signals and the maximum-width-pulse signal; and

the switch control circuitry further includes an ~~the~~ encoder ~~is~~ operative to generate the second sets of control signals based on the second digital sub-signal.

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58. (Currently Amended) A digital audio system according to claim 56, wherein (i) the electrical signal from which the acoustic audio component signal of the first channel is generated is a multi-level electrical signal, (ii) the ~~set of switches, the first and second set of control signals, and the level selector are associated with the second channel,~~ level selector associated with the second channel is operative to assert each of the first set of control signals of the second channel in response to a second set of control signals for the second channel, and (iii) the switch control circuitry includes an encoder ~~is~~ operative to generate the second sets of control signals for the first and second channels in response to the second digital sub-signal, and further comprising:

a set of switches for the first channel within the switching circuitry, each switch in the set of switches for the first channel being operative based on assertion of a corresponding one of first set of control signals for the first channel to provide one of the set of distinct levels of the multi-level electrical signal of the first channel; and

a level selector for the first channel within the switch control circuitry ~~being~~ operative to assert each of the first set of control signals of the first channel based on the pulse width modulated signal, the maximum-width-pulse signal and the second set of control signals of the first channel.

59. (Original) A digital audio system according to claim 56, wherein:

the multi-level electrical signal of the second channel is a fixed-pulse-width electrical signal, the acoustic audio component

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signal of the second channel is a fixed-pulse-width acoustic audio component signal, and the acoustic audio component signal of the first channel is a variable-pulse-width acoustic audio component signal generated from a variable-pulse-width electrical signal; and

the switching circuitry includes a set of switches for the first channel operative in response to assertion of the pulse width modulated signal to generate the variable-pulse-width electrical signal.

60. (Currently Amended) A digital audio system according to claim 56, wherein the digital signal is a first frequency component and each of the acoustic audio component signals is in a first frequency band associated with the first frequency component, the acoustic audio component signals in the first frequency band being additively combined to form a first frequency acoustic audio signal, and the acoustic audio signal is generated by additively combining the first frequency acoustic audio signal in the first frequency band with a second frequency acoustic audio signal in a second frequency band associated with a second frequency component, ~~the second frequency component including third and fourth digital sub-signals carrying respective least and most significant components of the second frequency component,~~ and wherein the channels are channels in the first frequency band and the plurality of loudspeakers, plurality of low-pass filters, pulse width modulated signal, maximum-width-pulse signal, switching circuitry, PWM circuitry, level selector and ~~encoder~~ switch control circuitry are a plurality of first loudspeakers, a plurality of first low-pass filters, first pulse width modulated

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signal, first maximum-width-pulse signal, first switching circuitry, first PWM circuitry, first level selector and first ~~encoder~~ switch control circuitry respectively associated with the first frequency band, and further comprising:

a second loudspeaker associated with the second frequency band;

a second low-pass filter coupled to the second loudspeaker;

a band-separating filter operative to generate the first and second frequency components of the digital signal;

second switching circuitry operative in response to assertion of a ~~third set of control signals~~ second pulse width modulated signal to generate an electrical signal from which the second frequency acoustic audio signal ~~in the second frequency band~~ is generated, the electrical signal being provided to the second low-pass filter; and

second PWM circuitry operative to generate ~~a~~ the second pulse width modulated signal ~~and a maximum width pulse signal, the pulse width modulated signal being~~ based on the second frequency component~~third digital sub-signal, the maximum width pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the electrical signal; and~~

~~second level selector being operative to assert each of the third set of control signals based on the pulse width modulated signal, the maximum width pulse signal and the fourth digital sub-signal~~.

61. (Currently Amended) A digital audio system according to claim ~~60~~ 85, wherein the multi-level electrical signal is ~~a multi level electrical signal~~ one of a plurality of multi-level electrical

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signals ~~from which the second frequency acoustic audio signal~~ in the second frequency band~~ is generated~~, each multi-level electrical signal in the second frequency band being generated from a corresponding one of a plurality of channels in the second frequency band;

the second frequency acoustic audio signal is generated by additively combining a plurality of acoustic audio component signals from the plurality of channels in the second frequency band, the acoustic audio component signal of each channel in the second frequency band being generated from a corresponding one of the multi-level electrical signals;

the second loudspeaker is one of a plurality of second loudspeakers each associated with a corresponding one of the channels in the second frequency band;

the second low-pass filter is one of a plurality of second low-pass filters each coupled to a corresponding one of the second loudspeakers;

the second switching circuitry includes a plurality of sets of switches, each set being associated with a corresponding one of the channels in the second frequency band, and the third set of control signals is one set of a plurality of third sets of control signals, each third set of control signals being associated with a corresponding channel in the second frequency band, each switch in the set of switches for each channel in the second frequency band being operative in response to assertion of a corresponding one of the third set of control signals for the corresponding channel in the second frequency band to provide one of a set of distinct levels of the multi-level electrical signal of the corresponding channel in the second frequency band;

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each multi-level electrical signal generated from a corresponding one of the channels in the second frequency band is provided to its corresponding low-pass filter;

the second level selector is one of a plurality of second level selectors each being associated with a corresponding one of the channels in the second frequency band, the second level selector associated with a first one of the channels in the second frequency band being operative to assert each of the third set of control signals for the first channel in the second frequency band based on the second pulse width modulated signal, the second maximum-width-pulse signal and a fourth set of control signals for the first channel in the second frequency band, each of the other second level selectors being operative to assert control signals of the third set of control signals of the corresponding channel in the second frequency band in response to a fourth set of control signals for the corresponding channel in the second frequency band and the second maximum-width-pulse signal; and

the second switch control circuitry further ~~comprising a second~~ includes an encoder ~~in the second frequency band~~ operative to generate the fourth set of control signals for each channel in the second frequency band based on the fourth digital sub-signal.

62. (Original) A digital audio system according to claim 60, wherein the first frequency band is a higher frequency band with more channels and the second frequency band is a lower frequency band with fewer channels.

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63. (Currently Amended) A digital audio system according to claim 56, wherein ~~each set of~~ the plurality of sets of switches ~~is~~ are not coupled to a ~~different~~ single power supply.

64. (Currently Amended) A digital audio system according to claim 56, the digital audio system ~~apparatus~~ being contained within a single enclosure.

65. (Currently Amended) A digital audio system according to claim 56, wherein the switches in each set of switches are arranged in a multiple H-bridge configuration and are operative to apply either (1) zero voltage level to both ends of a load connected to the switches, the load comprising a low-pass filter coupled to a loudspeaker, or (2) ~~equal magnitudes of~~ a positive ~~and~~ or negative voltage level to ~~opposite~~ one end~~s~~ of the load and a zero voltage level to the other end at ~~one~~ any given time, such that current flowing through the load in one direction represents one positive voltage level, current flowing through the load in the reverse direction represents one negative voltage level, and no current flowing through the load represents a zero voltage level.

66. (Original) A digital audio system according to claim 56, wherein the switching circuitry is operative to select positive and negative voltages to generate the acoustic audio signal.

67. (Currently Amended) A digital audio system according to claim 56, wherein each of the levels in the set of distinct levels of each electrical signal is a corresponding ~~multiple~~ ratio of a reference level and control of the volume of the acoustic audio

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signal is obtained by controlling the magnitude of the reference level.

68. (New) Apparatus according to claim 22, further comprising an interpolator operative to generate a second digital signal from the second frequency component, the second digital signal carrying multi-bit values at a second sampling rate higher than the sampling rate of the second frequency component and a noise shaper operative to generate a coarsely quantized digital signal from the second digital signal, and wherein the second PWM circuitry is operative to generate the second pulse width modulated signal in response to the coarsely quantized digital signal.

69. (New) Apparatus according to claim 23, further comprising a noise shaper operative to generate a coarsely quantized digital sub-signal from the third digital sub-signal, and wherein the second PWM circuitry is operative to generate the second pulse width modulated signal in response to the coarsely quantized digital sub-signal.

70. (New) Apparatus according to claim 23, further comprising an interpolator operative to generate a second digital signal from the second frequency component, the second digital signal carrying multi-bit values at a second sampling rate higher than the sampling rate of the second frequency component and wherein the third and fourth digital sub-signals are not included in the second frequency component but included in the second digital signal and carry respective least and most significant components of the multi-bit values carried by the second digital signal.

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71. (New) Apparatus according to claim 30, wherein the control signals comprising the second sets of control signals generated by the encoder based on the second digital sub-signal are numbered consecutively starting from one and corresponding to the value of the second digital sub-signal such that all control signals having a number less than or equal to the value of the second digital sub-signal will be turned on else turned off and the numbered control signals are interleaved among the different sets of second sets of control signals according to the numbers assigned to them.

72. (New) Apparatus according to claim 35, wherein:

the second frequency component includes third and fourth digital sub-signals carrying respective least and most significant components of the multi-bit values carried by the second frequency component;

the electrical signal is a multi-level electrical signal from which the second frequency analog output is generated;

second switching circuitry is operative in response to assertion of a third set of control signals to generate the multi-level electrical signal; and

second switch control circuitry includes a second level selector operative to assert each of the third set of control signals in response to the second pulse width modulated signal, a second maximum-width-pulse signal and the fourth digital sub-signal, the second maximum-width-pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the second pulse width modulated signal.

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73. (New) Apparatus according to claim 35, further comprising an interpolator operative to generate a second digital signal from the second frequency component, the second digital signal carrying multi-bit values at a second sampling rate higher than the sampling rate of the second frequency component and a noise shaper operative to generate a coarsely quantized digital signal from the second digital signal, and wherein the second PWM circuitry is operative to generate the second pulse width modulated signal in response to the coarsely quantized digital signal.

74. (New) Apparatus according to claim 72, further comprising a noise shaper operative to generate a coarsely quantized digital sub-signal from the third digital sub-signal, and wherein the second PWM circuitry is operative to generate the second pulse width modulated signal in response to the coarsely quantized digital sub-signal.

75. (New) Apparatus according to claim 72, further comprising an interpolator operative to generate a second digital signal from the second frequency component, the second digital signal carrying multi-bit values at a second sampling rate higher than the sampling rate of the second frequency component and wherein the third and fourth digital sub-signals are not included in the second frequency component but included in the second digital signal and carry respective least and most significant components of the multi-bit values carried by the second digital signal.

76. (New) A digital audio system according to claim 45, further comprising a noise shaper operative to generate a coarsely

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quantized digital sub-signal from the first digital sub-signal, and wherein the PWM circuitry is operative to generate the pulse width modulated signal in response to the coarsely quantized digital sub-signal.

77. (New) A digital audio system according to claim 45, further comprising an interpolator operative to generate a first digital signal from the digital signal, the first digital signal carrying multi-bit values at a first sampling rate higher than the sampling rate of the digital signal and wherein the first and second digital sub-signals are not included in the digital signal but included in the first digital signal and carry respective least and most significant components of the multi-bit values carried by the first digital signal.

78. (New) A digital audio system according to claim 49, further comprising a noise shaper operative to generate a coarsely quantized digital sub-signal from the first digital sub-signal, and wherein the PWM circuitry is operative to generate the pulse width modulated signal in response to the coarsely quantized digital sub-signal.

79. (New) A digital audio system according to claim 49, further comprising an interpolator operative to generate a first digital signal from the digital signal, the first digital signal carrying multi-bit values at a first sampling rate higher than the sampling rate of the digital signal and wherein the first and second digital sub-signals are not included in the digital signal but included in the first digital signal and carry respective least

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and most significant components of the multi-bit values carried by the first digital signal.

80. (New) A digital audio system according to claim 50, further comprising an interpolator operative to generate a second digital signal from the second frequency component, the second digital signal carrying multi-bit values at a second sampling rate higher than the sampling rate of the second frequency component and a noise shaper operative to generate a coarsely quantized digital signal from the second digital signal, and wherein the second PWM circuitry is operative to generate the second pulse width modulated signal in response to the coarsely quantized digital signal.

81. (New) A digital audio system according to claim 51, further comprising a noise shaper operative to generate a coarsely quantized digital sub-signal from the third digital sub-signal, and wherein the second PWM circuitry is operative to generate the second pulse width modulated signal in response to the coarsely quantized digital sub-signal.

82. (New) A digital audio system according to claim 51, further comprising an interpolator operative to generate a second digital signal from the second frequency component, the second digital signal carrying multi-bit values at a second sampling rate higher than the sampling rate of the second frequency component and wherein the third and fourth digital sub-signals are not included in the second frequency component but included in the second digital signal and carry respective least and most significant

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components of the multi-bit values carried by the second digital signal.

83. (New) A digital audio system according to claim 56, further comprising a noise shaper operative to generate a coarsely quantized digital sub-signal from the first digital sub-signal, and wherein the PWM circuitry is operative to generate the pulse width modulated signal in response to the coarsely quantized digital sub-signal.

84. (New) A digital audio system according to claim 56, further comprising an interpolator operative to generate a first digital signal from the digital signal, the first digital signal carrying multi-bit values at a first sampling rate higher than the sampling rate of the digital signal and wherein the first and second digital sub-signals are not included in the digital signal but included in the first digital signal and carry respective least and most significant components of the multi-bit values carried by the first digital signal.

85. (New) A digital audio system according to claim 60, wherein:

the second frequency component includes third and fourth digital sub-signals carrying respective least and most significant components of the multi-bit values carried by the second frequency component;

the electrical signal is a multi-level electrical signal from which the second frequency acoustic audio signal is generated;

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second switching circuitry is operative in response to assertion of a third set of control signals to generate the multi-level electrical signal; and

second switch control circuitry includes a second level selector operative to assert each of the third set of control signals in response to the second pulse width modulated signal, a second maximum-width-pulse signal and the fourth digital sub-signal, the second maximum-width-pulse signal establishing the maximum permissible pulse duration in a sampling cycle for the second pulse width modulated signal.

86. (New) A digital audio system according to claim 60, further comprising an interpolator operative to generate a second digital signal from the second frequency component, the second digital signal carrying multi-bit values at a second sampling rate higher than the sampling rate of the second frequency component and a noise shaper operative to generate a coarsely quantized digital signal from the second digital signal, and wherein the second PWM circuitry is operative to generate the second pulse width modulated signal in response to the coarsely quantized digital signal.

87. (New) A digital audio system according to claim 85, further comprising a noise shaper operative to generate a coarsely quantized digital sub-signal from the third digital sub-signal, and wherein the second PWM circuitry is operative to generate the second pulse width modulated signal in response to the coarsely quantized digital sub-signal.

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88. (New) A digital audio system according to claim 85, further comprising an interpolator operative to generate a second digital signal from the second frequency component, the second digital signal carrying multi-bit values at a second sampling rate higher than the sampling rate of the second frequency component and wherein the third and fourth digital sub-signals are not included in the second frequency component but included in the second digital signal and carry respective least and most significant components of the multi-bit values carried by the second digital signal.

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